

I CLAIM:

1. A rechargeable cooling device, comprising:  
a first reservoir configured to contain a liquid;  
a second reservoir configured to contain a vapor of said liquid;  
a heat exchanger connected to at least one of said first and second reservoirs; and  
a reusable valve,  
wherein said first reservoir is in fluid connection with said second reservoir via said reusable valve, and  
wherein the cooling device is configured so that:
  - (a) when said first reservoir contains said liquid at a first pressure and said second reservoir contains said vapor at a second pressure lower than said first pressure, said heat exchanger may be made to absorb heat at least in part by opening said reusable valve and allowing said liquid to vaporize as said first and second pressures equalize; and
  - (b) when pressures in said first and second reservoirs are approximately equal at a first temperature, and after said heat exchanger has been made to absorb heat, said cooling device may be recharged for a subsequent use at least in part by cooling said cooling device to a second temperature lower than said first temperature.
2. The rechargeable cooling device as in claim 1, further comprising said liquid, wherein said liquid is a refrigerant having a vapor pressure at room temperature greater than 1 atm.
3. The rechargeable cooling device as in claim 2, comprising said liquid in a quantity such that, when said valve is open and pressures in said first and second reservoirs are approximately equal at said first temperature, said liquid is substantially entirely vaporized, wherein said first temperature is in the range of approximately 70° to 100°F.
4. The rechargeable cooling device as in claim 1, further comprising a third reservoir connected to said heat exchanger and configured to hold a substance desired to be cooled,

wherein said rechargeable cooling device is an insulated mug, and wherein said third reservoir is shaped to contain no more than about 16 fluid ounces of a beverage.

5. The rechargeable cooling device as in claim 1, further comprising a third reservoir connected to said heat exchanger and configured to hold a substance desired to be cooled, wherein said rechargeable cooling device is an insulated cooler having a storage volume in excess of one cubic foot, and wherein said third reservoir is said storage volume.

6. The rechargeable cooling device as in claim 1, further comprising a third reservoir connected to said heat exchanger and configured to hold a substance desired to be cooled, wherein said rechargeable cooling device is an insulated cooler having a storage volume in excess of one cubic foot, and wherein said third reservoir is a cooling volume of said storage volume having a volume not more than about 48 fluid ounces.

7. The rechargeable cooling device as in claim 6, wherein said cooling volume is shaped to hold and cool at least one and not more than four 12-ounce beverage cans.

8. The rechargeable cooling device as in claim 1, wherein said second reservoir comprises a funnel configured so that while said cooling device is being cooled to said second temperature, liquid condensed from said vapor in said second reservoir falls down said funnel into said first reservoir.

9. The rechargeable cooling device as in claim 8, wherein said valve comprises a valving portion configured to mate with a bottom of said funnel, and wherein said valve may be opened by moving said valving portion downward and closed by moving said valving portion upward.

10. The rechargeable cooling device as in claim 8, wherein said valve comprises a valving portion configured to mate with a bottom of said funnel, and wherein said valve may be opened by moving said valving portion upward and closed by moving said valving portion downward.

11. The rechargeable cooling device as in claim 10, wherein said valve is pressure regulating so as to prevent said first pressure from exceeding a predetermined maximum pressure.
12. The rechargeable cooling device as in claim 1, further comprising a refrigerator comprising a second heat exchanger connected to at least one of said first and second reservoirs, said refrigerator configured to cool and condense said vapor during recharging of said cooling device.
13. The rechargeable cooling device as in claim 12, wherein said refrigerator is removably connected to said cooling device.
14. The rechargeable cooling device as in claim 1, wherein said valve is adjustable so that a flow rate of vapor passing through said valve may be adjusted.
15. The rechargeable cooling device as in claim 1, further comprising a pressure relief valve connected to at least one of said first and second reservoirs.
16. The rechargeable cooling device as in claim 1, wherein said second reservoir has a volume at least ten times greater than a volume of said first reservoir.
17. The rechargeable cooling device as in claim 1, wherein said second reservoir further comprises an absorbent material chosen to absorb said vapor.
18. A method for cooling a substance, comprising:  
providing a rechargeable cooling device, comprising:
  - a first reservoir configured to contain a liquid;
  - a second reservoir configured to contain a vapor of said liquid;
  - a heat exchanger connected to at least one of said first and second reservoirs; and
  - a reusable valve,

wherein said first reservoir is in fluid connection with said second reservoir via said reusable valve;  
placing said substance in thermal contact with said heat exchanger;  
opening said reusable valve when said first reservoir contains said liquid at a first pressure and said second reservoir contains said vapor at a second pressure lower than said first pressure;  
allowing said liquid to vaporize and said heat exchanger to absorb heat from said substance; and  
recharging said cooling device by:  
    cooling said vapor to condense said vapor into said liquid;  
    containing substantially all of said condensed liquid in said first reservoir by, if necessary, transferring said condensed liquid to said first reservoir; and  
    closing said reusable valve.

19. A method as in claim 18, further comprising providing a third reservoir connected to said heat exchanger, and placing said substance in said third reservoir.

20. A method of advertising a rechargeable cooling device, comprising:  
indicating that said cooling device is capable of cooling at least one of foods and beverages without an external source of power; and  
indicating that said cooling device may be recharged for a subsequent use at least in part by cooling said cooling device in a freezer; and  
indicating that said cooling device is capable of said cooling at any time, on demand, after said cooling device has been recharged and removed from said freezer.